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The rugged islands of Laurentian and Huronian rocks correspond in both regions, and show an identity of succession in deposits as well as a synchronism of the great folds and lateral pressures which have disturbed these old formations on both sides of the Atlantic. The Cambrian sediments and fossils as originally described by Hartt, and more recently and in so great detail by Matthew, are in close correspondence with those of Wales, and not identical with those of internal America. The recent paper of Lapworth on the graptolites affords evidence of the same kind, and shows that these were Atlantic animals in their time. It also throws much additional light on the Quebec group of Logan, considered as an Atlantic marginal formation, representing a great lapse of time in the Cambrian and Ordovician periods. The author had long ago shown that the Siluro-Cambrian or Ordovician of Nova Scotia conformed more nearly to that of Cumberland and Wales than to the great limestone formations of Quebec, Ontario, and New York. The upper Silurian also is of the type of that of England and Wales, — a fact very marked in its fossil remains as well as in its sediments.

The parallelism in the Erian or Devonian in both countries is most marked, both in rocks and fossils; and, while this is apparent in the fishes as worked up by Mr. Whiteaves, it is no less manifest in the fossil plants as described by the author.

The carboniferous, in its limited troughs, the character of its beds, and its fossil animals and plants, also points to a closer relationship in that period between the two shores of the Atlantic than between the Atlantic coast and the inland area. This was evidenced by comparative lists of species.

The trias of Nova Scotia and of Prince Edward Island, as the author had shown in 1868 (*Journ. geol. soc. Lond.*), resembles that of England very closely in its aqueous deposits and in its associated trappean rocks.

Beyond this, the geology of the maritime provinces presents no materials for comparison till we arrive at the bowlder drift and other pleistocene deposits. In regard to these, without entering into disputed questions any further than to say that the observations of the author, as well as those more recently made by Mr. Chalmers, conclusively proved that submergence and local ice-drift were dominant as causes of distribution of bowlders and other material, there was evidence of great similarity. The marine beds described by Mr. Matthew at St. John were precise equivalents of the Clyde beds of Scotland, as were the upper shell-bearing beds of Prince Edward Island and Bay de Chaleur of those in Aberdeenshire and other parts of Scotland, and the Udevalla beds of Sweden. The bowlders drifted from Labrador to Nova Scotia were the representatives of those in Europe scattered southward from Scandinavia, and the local drift in various directions from the hills was the counterpart of that observed in Great Britain. The survival of *Mastodon giganteus* in Cape Breton, to the close of the pleistocene, is a decided American feature, and so is the absence of any evidence of pleistocene man.

The conclusion of the author was, that, in so far as paleontology and the subdivisions of systems of formations are concerned, the geology of the maritime provinces is European, or perhaps more properly Atlantic, rather than American, and is to be correlated rather with the British Islands and Scan-

dinavia than with interior Canada and the United States. The latter country, even on its eastern coast, possesses a much less perfect representation of these Atlantic deposits than that in the maritime provinces and Newfoundland; though the recent studies of Crosby, Dale, and others are developing new points of this kind in the geology of New England, and Hitchcock and others have shown that the New Brunswick geology extends into Maine.

The paper further discussed the bearing of these facts on the successive stages of the physical geography of eastern America in the Cambrian, Silurian, Erian, carboniferous, and triassic records.

J. WM. DAWSON.

Montreal, May 30.

Sea-sickness.

In *Science* for June 3, I find a very interesting review of the medical literature of this subject. It is but natural that means, both prophylactic and curative, should be sought for the benefit of those who find a sea-voyage one of torment rather than pleasure; and the writer has frequently thought that some suggestions derived from the otologist's experience might not be without interest in this connection. Thus, in a considerable experience among persons suffering from aural disease, it has been found that vertiginous symptoms are of frequent occurrence; that the phenomena, in fact, which constitute what is known as 'sea-sickness,' are by no means exclusively experienced by the comparatively few who submit to being tossed about at sea. Indeed, as every one familiar with the subject very well knows, most of the symptoms going to make up this malady are found, in some form or other, to render the lives of a great many persons living upon *terra firma* most miserable. A great many of these individuals experience almost daily, frequently much oftener, sea-sickness without ever going on board ship. The sufferings of these seem to be owing to a faulty condition of the transmitting mechanism of the ear, — defects in respect to which it may be said, that, when normal tension of this portion of the hearing-organ is thus wanting, nearly all the symptoms of sea-sickness may take place from slight though altogether unavoidable, constantly occurring causes. Persons thus affected cannot rise up suddenly from a recumbent position, or otherwise change the pose of the head, without feeling dizzy or staggering when attempting locomotion. Sometimes they experience nausea, and feel faint and otherwise miserable. Or the mere acts of swallowing, yawning, or hiccoughing, whereby intra-tympanal aeration is suddenly altered, may be followed by distressing and sometimes alarming symptoms. The experience of vertiginous phenomena in some form or other, closely simulating what is known as 'sea-sickness,' likewise occurs to the aurally defective in consequence of cerebral concussion caused by impacts of the stapes upon the fluid in the labyrinth, and arising from oscillatory movements of the drum-head when its functions are no longer under the dominance of normal tension. The erratic drum-head, flapping in response to sudden movements of the head, acts of swallowing, etc., would seem to force the stapes into and out of the oval window to an extent far exceeding its physiological limits; and, thus jostled about, the stapes, with each excursion of the drum-head, imparts a shock to the labyrinthine fluid. I am aware that it has long been held by physiologists

that the disturbances of equilibrium which I have above attributed to concussion, are due to some specific functional disturbance in the semicircular canals; but observations drawn from a study of a large number having anomalies of the drum of the ear, lead me to exclude that theory. It is true of the aurally vertiginous just described, that they represent chronic forms of ear-disease, and are usually neuropathic subjects beyond middle life. But similar cerebral disturbances are not unusual at any age in acute inflammation of the middle ear. Other things being equal, elderly persons are less obnoxious to sea-sickness than the young, since the latter are much more susceptible to impressions upon the nervous system. A friend of the writer who has made many ocean-voyages was always a great sufferer in this regard in early life, but in after years experienced but little inconvenience in the roughest weather. On one occasion, however, a berth was assigned him in the after part of a vessel, when, after experiencing for a short time the discomfiting concussions arising from the motions of the screw, he became dreadfully sea-sick while lying in bed. The distress becoming unbearable, he was removed to a berth amidships, when recovery was almost immediate. It is well known that persons at the beginning of a voyage may become quite sea-sick, and yet entirely recover before landing, — an experience probably due to the bracing effect of sea-air. It will be seen, that, regarded from the point of view afforded by an aurist's clinical experience, nearly all of the phenomena of sea-sickness may be said to occur on shore, in consequence of cerebral (labyrinthine) concussion, especially during a state of nervous exhaustion. Sea-sickness would seem to be brought about in most instances, irrespective of aural defects, from the agitation of the cerebro-spinal fluid caused by the motions of a vessel at sea, as has already been described by other writers. Of course, the concussive impact from tossing upon the waves is usually very gentle, but its long continuance finally overcomes the resisting power of the subject. The effect may be to make one tired or sleepy only, but too often nausea and dreadful depression are experienced. As in auditory concussion, such symptoms as a sense of constriction or of pain and great tension in the head characterize the more severe cases arising at sea. It is seldom that the landsman experiences the uninterrupted jarring of the brain which must be endured at sea; but the writer has seen many cases where the despondency from the concussion of sound even, as well as the other causes before mentioned, was almost as great as could be endured.

Where so many conditions favor the occurrence of sea-sickness, it is scarcely to be hoped that any specific cure will ever be found. In the writer's own experience, the nitrite of amyl, properly employed, has often been found to relieve some of the more disagreeable symptoms, through its influence on the vaso-motor system.

SAMUEL SEXTON.

New York, June 8.

Two balloon-voyages.

The two hundred and fiftieth anniversary of the founding of the city of Providence, R.I., afforded an opportunity for making meteorological observations in the free air. Mr. Hazen of the signal office, Washington, D.C., volunteered his services, and was ac-

cepted. On June 24, with a light east-north-east breeze and a gentle rain, the balloon City of Boston left Providence at 5.35 in the afternoon. There were four persons on board, which made it a little crowded; but by leaning out of the basket it was found possible to make the observations, which consisted chiefly in readings of an aneroid barometer, a sling psychrometer, and a watch. The balloon passed over Fishville, Hope, Coventry Centre, and West Greenwich, R.I., and landed in the tree-tops of Voluntown, Conn., at a little after 7.30. The temperature, on leaving the earth, was 60°.2, and at no part of the voyage did it reach a point below 56°.7. The highest point reached was 850 feet, at 6.43. An interesting observation on this voyage was the continual rising and falling of the balloon without the expenditure of ballast. This was partly due to the following: 1. A momentum acquired by the balloon was checked when the drag-rope (about seven hundred feet long) left the earth. Then the balloon began to descend till sufficient weight of the rope on the ground gave it enough buoyancy to rise: this, in turn, was counterbalanced as before. 2. A rise in the balloon was accompanied by a slight fall in temperature: this affected the gas, and gave it less buoyancy. On the other hand, a fall brought the balloon into warmer air, which had a tendency to reverse the former effect.

On June 25 the veteran aeronaut, James Allen of Providence, R.I., and Mr. Hazen, made a voyage, starting from the landing-place of the night previous. The air was perfectly still, and while there was no rain falling, yet the appearance of a heavy fog or mist hung rather low on the hillsides. It was impossible to discern any motion in this mist or in clouds above it.

The start was made at 7.44 in the morning, the air temperature being 61°.3. It was decided to make as high an ascent as possible. The earth was lost sight of at about 1,160 feet. The lowest temperature in the cloud was 58°.3, at 1,670 feet; and from this point it rose rapidly to 65°.6, at 2,450 feet. The highest point reached was 9,780 feet, at 9.18, with a temperature of 48°. Having been out of sight of land more than an hour, and the proximity to sea being rather close, it was deemed prudent at this point to make a descent, which was done with great rapidity; the basket striking the earth with some force, having fallen the 9,700 feet in thirteen minutes, or at the rate of twelve feet per second. The balloon landed within about two and one-half miles of the point from which the ascent of the previous day was made. The temperature at landing was 64°.2, with a gentle north-east wind. At a height of about 8,400 feet the shadow of the balloon was seen upon the clouds, with two rainbow-colored rings about it. Besides the interesting observations of temperature, indicating a rise of over eight degrees in an ascent of eight hundred feet, and showing that just at the top of the cloud the temperature was abnormally high, there were also observations on the direction of the balloon above the clouds. It has been usually considered that above the clouds it is impossible to tell any directions. It was found, on throwing over dried leaves, that they took a definite direction as shown by the compass, and afterward it was found that the balloon was moving in the direction which was indicated by the observer, or slower than the leaves. At the time this observation was made, the balloon was slowly rising, and it